

APPENDIX A

BASELINE AND FUTURE SOURCE EMISSIONS CALCULATIONS

This appendix presents a summary of the protocol for the emissions analysis and the development of emissions factors for criteria pollutants and TACs from Facility sources that was submitted to MDAQMD prior to development of the Facility's ATEIP. ERMI was contracted by the Facility to compile an emissions inventory to support activities associated with current and continued operations at the site. The emissions inventory analyses calculated the emissions for the current “baseline” operational conditions and for each phase of the 30-year plan. The emissions inventory included point sources as well as fugitive sources.

The ATEIP was prepared in accordance with the requirements of the CARB document titled “Emissions Inventory Criteria and Guidelines Report” for the Air Toxics “Hot Spots” program, dated May 15, 1997 (Guidelines Report). The purpose of the ATEIP is to identify the sources that either emit or have the potential to emit any of the TACs specified in Appendix A of the Guidelines Report. In addition to the TACs specified in Appendix A of the Guidelines Report, ERMI was asked by the MDAQMD to include criteria pollutants. The ATEIP identifies all of the emissions sources at the Facility including stationary point sources, fugitive operational sources, mobile emissions (combustion and dust entrainment from unpaved roads), and wind generated emissions from stockpile and open area sources. ERMI used a variety of emission factors to prepare the ATEIP. Reference sources for these emissions factors include the following:

- Mojave Desert Air Quality Management District Emissions Inventory Guidance “Mineral Handling and Processing Industries”- 1998;
- USEPA AP-42 Emissions Factors Volume I;
- USEPA AP-42 Emissions Factors Volume II;
- CARB California Air Toxics Emission Factors May 1996;
- Molycorp, Inc. Product Analytical Data (Metals);
- Tetra Tech, Inc. Material analysis of various road dust, tailings material, ore material, and overburden material (metals, asbestos, silica, radionuclides);
- Rodgers & Associates, Inc. Radiological Characterization of Material Streams at Molycorp Facility at Mountain Pass, California, November 1989 (Radionuclides: Thorium 232 & 228, Radium 228 & 226, Uranium 238); and
- Site Specific Source Tests:
 - 1997 ERMI Mill/Separations Plant Boiler Source Test (NO_x, CO)

- VOC, Inc. - SX-1 Source Test (TGNMOC)
- 1993 - VOC Testing Inc. Gaseous Chlorine and HCl from the Lanthanum Scrubber
- 1990 - VOC Testing Inc. TGNMOC Emissions from the RES Plant Stack SX-6
- 1990 - VOC Testing, Inc. Polycyclic Aromatic Hydrocarbon (PAH) and Formaldehyde from the Mill Boiler, Herreshoff Roaster, and Flotation Plant No. 1 Product Dryer.

A.1 Description of Facility Operations

The Mountain Pass Facility extracts lanthanides (bastnasite ore) by open-pit mining. The ore that is mined is the only deposit of its kind in the world that is mined solely for lanthanides and is presently a major supplier of lanthanide products throughout the world. The ore mined at this facility contains approximately 43 percent calcite, 25 percent barite and/or celestite, 12 percent strontianite, 12 percent bastnasite, 8 percent silica, and minor amounts of galena, hematite, and monazite. Bastnasite, the mineral of interest, contains 15 individual lanthanide elements in the form of a mixed lanthanide fluorocarbonate. The following major products are either concentrated, extracted or beneficiated at the facility:

- Bastnasite concentrate;
- Cerium concentrate;
- Mixed purified lanthanum concentrate; and
- Numerous cerium, neodymium, praseodymium, yttrium, europium, samarium, gadolinium, and other purified lanthanide specialty products.

In addition to bastnasite ore, the Facility produces small volume specialty lanthanide products using lanthanide materials obtained from other facilities. Demands for the lanthanide elements fluctuate often and since the bastnasite ore body contains a mixture for all 15 lanthanides, the facility's operations must be flexible. This is due to the fact that many markets for these elements are under development and new uses for lanthanides are being identified as research advances. The facility's basic operation (e.g., mining, milling, roasting, acid leaching, solvent extraction, filtration, and calcining/drying) remains constant; however, reagents, operating flows, and operating parameters may vary.

Beneficiation Reagents. Molycorp uses a variety of reagents to produce its various lanthanide products. Some reagents such as hydrochloric acid and nitric acid are key to the manufacturing operations. Other reagents may be interchanged from time to time with comparable substitutes. Examples of reagents used by Molycorp for which substitutes may be used include the following:

- Product reactants such as acetic acid (glacial), ammonium bicarbonate, ammonium bifluoride, ammonium hydroxide, ammonia, and oxalic acid;
- Neutralizing agents such as sodium hydroxide;
- Benefaction aides such as barium chloride, borax, calcium hydroxide, hydrogen peroxide, hydroxylamine hydrochloride, nitrogen, Nalco defoamers, potassium chloride, sodium carbonate, sodium hydrosulfide, sodium hydroxide and sodium sulfide, strontium carbonate, sulfuric acid, and zinc pellets;
- Extraction aids such as Cyclosol 53 solvent, kerosene, phosphoric acid esters, and Ionquest 801;
- Flotation aids such as Econofloat, Pamak, Pamolyn fatty acid, Rhodopan EC, sodium silicofluoride, Superfloc flocculent and Wesslig products; and
- Flocculents such as Nalco flocculents.

Substitution of these reagents is permissible under the Facility's permits and applicable MDAQMD regulations. Molycorp uses a number of petroleum products for fuel and lubricants, boiler conditioners, pollution control aid, fire prevention, cooling fluids, air compressor de-icers, and parts cleaning solvents.

The bastnasite ore undergoes numerous milling and beneficiation steps to produce the desired lanthanide products of various purities. The facility operations that further beneficiate the ore are identified in Table A.1.

TABLE A.1. OPERATIONS	
Facility	Process
Mine and Crushing	<ul style="list-style-type: none"> • Drilling • Crushing • Blasting • Loading/Hauling • Screening • Dust Collection
Flotation Plant, including Small Mill Circuit, Large Mill Circuit, and the Tailings Pond	<ul style="list-style-type: none"> • Grinding • Conditioning • Flotation • Leaching/Precipitation • Filtering • Drying • Packaging • Dust Collection
Separations Plant	<ul style="list-style-type: none"> • Roasting • Acid Leaching/Thickening • Drying • Packaging • Impurity Removal • Solvent Extraction Circuits • Precipitation • Thickening • Filtering • Purification Circuit • Off-Gas Scrubbing & Dust Collection
Cerium 96 Plant	<ul style="list-style-type: none"> • Acid Leaching • Impurity Removal • Precipitation • Filtering • Drying • Packaging • Off-Gas Scrubbing & Dust Collection • Scrubber Neutralization Solution Preparation
Specialty Plant	<ul style="list-style-type: none"> • Dissolution • Evaporation • Precipitation • Solvent Extraction • Filtering • Drying • Calcination • Packaging • Off-Gas Scrubbing & Dust Collection
Other Facilities	<ul style="list-style-type: none"> • Evaporation Pond • Crushed Ore Stockpiles • Product Ponds • Overburden Stockpile • Tailings Pond
Support Facilities	<ul style="list-style-type: none"> • Analytical Laboratory • Mobile Equipment Maintenance Shop • Fresh Water System • Domestic Sewage Pond

A.2 Baseline Emissions Inventory

In order to present a representative “baseline” emissions inventory, ERMI used operational production data from 1996 to calculate baseline emissions. According to Facility personnel, 1996 was the most recent full year of production and represents typical continued operations. EMRI incorporated the use of various source specific emission factors presented in the MDAQMD approved ATEIP. The ATEIP specified the use of USEPA emissions factors presented in AP-42, Chapter 11 and the MDAQMD Emissions Inventory Guidance for Mineral Handling and Processing Industries. These emissions factors were used to calculate emissions from various point sources, fugitive sources, and mobile sources. ERMI used the meteorological data collected at the Facility from 1995 and 1996 to calculate the fugitive area source emissions. According to CARB, there is a potential that the specified TACs may be generated from the combustion of gasoline and diesel fuels, and they were included in the facility-wide TAC inventory. The calculation of baseline emissions is shown in Tables A-1 to A-58.

A.3 Emission Inventory For Phase 1 And Phase 2 of the 30-Year Operations Plan

PHASE 1: YEARS 1-16

According to the *Mine and Reclamation Plan for the Mountain Pass Mine* (MolyCorp 1999a), the following construction activities will occur:

- The surface area of the open pit will increase by approximately 55 acres;
- The surface area of the West Overburden Stockpile will increase by approximately 90 acres;
- The surface area of the North Overburden Stockpile will increase by approximately 61 acres;
- Approximately 170 acres of evaporation ponds will be constructed within the boundary of the planned 250 acre evaporation ponds area;
- The first phase of the new East Tailings Storage Area will be constructed. The first phase of this development is approximately 165 acres. This facility will replace the existing North Tailings Storage Area (P-16). A new access road to this facility will be constructed to support its construction and operations; and
- The natural surface material from the Northwest Evaporation Pond construction and West Overburden Stockpile development will be stockpiled and stored for revegetation purposes. The South Tailings Storage area (P-1) and the lower reaches of the West Overburden Stockpile will be reclaimed using the salvaged topsoil and plants on an ongoing basis.

In order to calculate the mass emissions of criteria and TACs, ERMI used detailed construction/grading plans from the appropriate design and engineering firms responsible for

designing the East Tailings Storage facility, the Northwest Evaporation Ponds, mine pit extension, and the advancement of the Overburden Stockpiles (North and West). Based upon the information provided from these firms, ERMI used the following emission factors to calculate the mass emissions of TSP and PM₁₀:

- Mojave Desert Air Quality Management District (MDAQMD) Emissions Inventory Guidance (Mineral Handling and Processing Industries);
- AP-42, Chapter 11.9 “Western Surface Coal Mining”;
- AP-42, Chapter 11.19 “Construction Aggregate Processing”;
- AP-42, Chapter 13.2 “Fugitive Dust Sources”;
- AP-42, Chapter 13.2.2 “Unpaved Roads”;
- AP-42, Chapter 13.2.4 “Aggregate Handling and Storage Piles”;
- AP-42, Chapter 13.2.5 “Industrial Wind Erosion”; and
- AP-42, Chapter 3.3 “Gasoline and Diesel Industrial Engines”.

ERMI used analytical results from various samples collected by Tetra Tech during their most recent sampling in support of the EIR. In addition to the information provided by Tetra Tech, ERMI used other data sources such as previous source tests and any verifiable data obtained from the Facility or their subcontractors. ERMI applied the elemental percentage presented in the analytical results to the PM₁₀ fraction of the various emissions sources to determine the TAC emissions for the first phase of the 30-year plan. Calculations of Phase I Facility emissions are presented in Appendix A tables.

PHASE 2: YEARS 17-31

According to the *Mine and Reclamation Plan for the Mountain Pass Mine* (Molycorp 1999a), the following construction activities will occur:

- The surface area of the open pit will increase by approximately 12 acres;
- The surface area of the North Overburden Stockpile will increase by approximately 66 acres;
- The East Tailings Storage Area will be increased by approximately 57 acres;
- The Mill/Flotation Plant and Crusher will be relocated to the north of the Separations Plant in order to facilitate the southward expansion of the mine pit; and
- The salvaged surface material and plants from the Northwest Evaporation Pond construction, East Tailings Storage facility, and West Overburden Stockpile development will be used to reclaim the disturbed areas at the site.

In order to calculate the mass emissions of criteria and TACs, ERMI used detailed construction/grading plans from the appropriate design and engineering firms responsible for designing the East Tailings Storage facility, Northwest Evaporation Ponds, open pit expansion, and the expanded Overburden Stockpiles (North and West). Based upon the information provided from these firms ERMI used the same resources used in the Phase I calculations to calculate the mass emissions of TSP and PM₁₀ in this phase. Calculations of Phase II Facility emissions are presented in Appendix A tables.

A.4 CD-ROM Contents of Emission Inventories

The Appendix A folder on this report CD-ROM contains all the Excel workbooks used to calculate baseline and future emission inventories.

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 - Tables A-2 a-b

- Separation Plant Emissions
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- Specialty Plant Emissions
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 - Tables A-6 a-b

- Other Source Emissions
 - Tables A-7 a-b
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- Flotation Plant Emissions
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